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ICC-ES Report

PMG-1009

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Reissued 10/2016
This report is subject to renewal 10/2017

EVALUATION SUBJECT:

ePIPE[®] EPOXY LINED PIPING SYSTEM

DIVISION:

22 00 00—PLUMBING

SECTION:

22 11 16—DOMESTIC WATER PIPING

Report Holder:

ACE DURAFLO[®] SYSTEMS, LLC

3122 WEST ALPINE STREET
SANTA ANA, CA 92704



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ICC-ES PMG Listing**PMG-1009**

Effective Date: October 2016

This listing is subject to re-examination in one year.www.icc-es-pmg.org | (800) 423-6587 | (562) 699-0543

A Subsidiary of the International Code Council®

CSI: DIVISION: 22 00 00 — PLUMBING
Section: 22 11 16 — Domestic Water Piping

Product certification system:

The ICC-ES product certification system includes testing samples taken from the market or supplier's stock, or a combination of both, to verify compliance with applicable codes and standards. The system also involves factory inspections, and assessment and surveillance of the supplier's quality system.

Product: ePIPE® Epoxy Lined Piping System—Uses ePIPE® epoxy to coat the interior of existing but cleaned galvanized steel pipe or copper rigid tube pressurized potable water supply systems

Listee: Ace Duraflo® Systems, LLC
3122 West Alpine Street
Santa Ana, California 92704
www.aceduraflo.com

Compliance with the following codes:

2015, 2012 and 2009 *International Plumbing Code*® (IPC)
2015, 2012 and 2009 *International Residential Code*® (IRC)

Compliance with the following standards:

ASTM F2831-2012 Standard Practice for Internal Non Structural Epoxy Barrier Coating Material Used In Rehabilitation of Metallic Pressurized Piping Systems

ICC-ES LC1008-2009, PMG Listing Criteria for Internal Epoxy Barrier Pipe Coating Material for Water Supply Systems

ASTM D 4541-2009e1, Standard Test Method for Pull-off Strength of Coatings Using Portable Adhesion Testers

NSF 61-2015, Section 5, Drinking Water System Components – Health Effects

AWWA C210-2007, Liquid-Epoxy Coating System for the Interior and Exterior of Steel Water Pipe Lines

Identification:

Each container bears a label marked Part A or Part B, with the manufacturer's name (ACE DuraFlo®), the NSF 61 designation, product name and size, the ICC-ES PMG listing mark. See Figure 1. Each container is stamped on the top with the date of manufacture and the batch number. See Figure 2.

Internally coated pipe and tubing shall be permanently and legibly marked on each outlet and on the outside of exposed pipe with the following marking applied at intervals of not more than 20 ft.

Manufacturer's name or trademark and coating designation and material with prohibition on the use of flame and heat to repair any part of system. See figure 3.

Installation:

The ePIPE[®] System must be applied by authorized applicators trained by ACE DuraFlo[®] Systems, LLC. Existing piping or rigid tubes must be in good condition, with any cracks or leaks or visible signs of corrosion repaired. The following steps comprise the installation sequence:

1. The existing piping system is partially disassembled into separate sections, with flexible tube, valves and gasketed connections removed.
2. Each section is air-dried and sandblasted clean in accordance with the manufacturer's published instructions. The cleaned surface, when viewed without magnification, must be free of all visible oil, grease, dirt, mill scale, rust and previously applied coatings. Evenly dispersed, very light shadows, streaks, and discolorations caused by stains of mill scale, rust and old coatings are permitted to remain on no more than 33 percent of the surface. Slight residues of rust and old coatings are permitted to be left in the craters of pits, if the original surface is pitted. Upon completion, this level of cleaning must be visually verified and recorded by the applicator.
3. Each section is then pressure-tested with air to 100 psi (689.5 kPa), to verify that the pipe has no holes, cracks or leaks.
4. Using proprietary measuring and application equipment provided by ACE DuraFlo[®] Systems, ePIPE[®] is applied in one end of a pipe or tube section and forced by air pressure through the section.
5. After drying in accordance with the manufacturer's instructions, the ePIPE[®] applicator then reassembles the piping system and hydrostatically pressure tests to 150 psi (1034 kPa) in the presence of the code official or the official's designated representative.
6. In the presence of the code official or designated representative, the ePIPE[®] applicator then conducts a flow test to verify the minimum flow rate to each fixture in accordance with Table 604.3 of the IPC.
7. Design: See Tables 1-4 for flow rates and pressure drop based on an average coating thickness of 0.010 inch (0.254 mm).

Models: ACE DuraFlo[®] ePIPE[®] Systems is a proprietary, two-part, mechanically mixed epoxy material that is pneumatically applied to the interior of cleaned rigid-galvanized pipe or copper tube used to convey pressurized potable water. ePIPE[®] system is composed of 100 percent solids, two-component epoxy (1:1 by volume) which meets the requirements of NSF 61 Section 5. The ePIPE[®] System is recognized for application on either galvanized steel pipe or copper tube from 1/2 inch to 4 inches (12.7 to 101.6 mm) in diameter. The installed minimum thickness of the coating must be 0.004 inch (0.10 mm) on all sizes. The average coating thickness must not exceed 0.010 inch (0.254 mm) on 1/2-inch-diameter galvanized steel pipe and copper tube, or 0.014 inch (0.356 mm) on larger pipe and tube. The ePIPE[®] System is not for application on flexible pressure pipe or valves or on gasketed connections. The ePIPE[®] logo is shown in Figure 1.

Conditions of Listing:

1. The ePIPE[®] system must be installed in accordance with this listing and the manufacturer's published installation instructions. In the event of a conflict, the instructions in this listing govern.
2. The existing piping system must be fabricated from rigid copper tubing or galvanized steel pipe materials in accordance with the applicable code.
3. All leaks must be repaired prior to coating in such a way so as to restore the affected sections to a code-complying condition.
4. The ePIPE[®] Epoxy Lined Piping System is manufactured in Stockton, CA, under a quality control program with annual surveillance inspections by ICC-ES.

**TABLE 1—FLOW RATE, VELOCITY, AND FRICTION LOSS (WATER),
1/2-INCH COPPER TUBING, ASTM B88 WITH 10-MIL ACE DURAFLO® COATING**

| Flow Rate (gpm) | Type M ID= 0.549 | | Type L ID= 0.525 | | Type K ID= 0.507 | |
|--------------------|----------------------|--------------------------|----------------------|--------------------------|----------------------|--------------------------|
| | Velocity (ft/sec) | Press Loss (psi/100') | Velocity (ft/sec) | Press Loss (psi/100') | Velocity (ft/sec) | Press Loss (psi/100') |
| 1.00 | 1.36 | 0.59 | 1.48 | 0.74 | 1.59 | 0.88 |
| 2.00 | 2.71 | 2.38 | 2.96 | 2.97 | 3.18 | 3.54 |
| 3.00 | 4.07 | 5.35 | 4.45 | 6.69 | 4.77 | 7.96 |
| 4.00 | 5.42 | 9.51 | 5.93 | 11.89 | 6.36 | 14.16 |
| 5.00 | 6.78 | 14.86 | 7.41 | 18.58 | 7.95 | 22.12 |
| 6.00 | 8.13 | 21.40 | 8.89 | 26.76 | 9.54 | 31.86 |
| 7.00 | 9.49 | 29.12 | 10.37 | 36.42 | 11.12 | 43.36 |
| 8.00 | 10.84 | 38.04 | 11.86 | 47.57 | 12.71 | 56.63 |
| 9.00 | 12.20 | 48.14 | 13.34 | 60.20 | 14.30 | 71.67 |
| 10.00 | 13.55 | 59.44 | 14.82 | 74.32 | 15.89 | 88.49 |
| 11.00 | 14.91 | 71.92 | 16.30 | 89.93 | 17.48 | 107.07 |
| 12.00 | 16.26 | 85.59 | 17.78 | 107.02 | 19.07 | 127.42 |
| 13.00 | 17.62 | 100.45 | 19.27 | 125.61 | 20.66 | 149.54 |
| 14.00 | 18.97 | 116.50 | 20.75 | 145.67 | 22.25 | 173.43 |
| 15.00 | 20.33 | 133.73 | 22.23 | 167.23 | 23.84 | 199.10 |
| 16.00 | 21.69 | 152.16 | 23.71 | 190.27 | 25.43 | 226.53 |
| 17.00 | 23.04 | 171.77 | 25.20 | 214.79 | 27.02 | 255.73 |
| 18.00 | 24.40 | 192.58 | 26.68 | 240.81 | 28.61 | 286.70 |

**TABLE 2—FLOW RATE, VELOCITY, AND FRICTION LOSS (WATER),
3/4-INCH COPPER TUBING, ASTM B88 WITH 10-MIL ACE DURAFLO® COATING**

| Flow Rate (gpm) | Type M ID= 0.791 | | Type L ID= 0.765 | | Type K ID= 0.725 | |
|--------------------|----------------------|--------------------------|----------------------|--------------------------|----------------------|--------------------------|
| | Velocity (ft/sec) | Press Loss (psi/100') | Velocity (ft/sec) | Press Loss (psi/100') | Velocity (ft/sec) | Press Loss (psi/100') |
| 1.00 | 0.65 | 0.09 | 0.70 | 0.11 | 0.78 | 0.14 |
| 2.00 | 1.31 | 0.37 | 1.40 | 0.43 | 1.55 | 0.57 |
| 3.00 | 1.96 | 0.82 | 2.09 | 0.97 | 2.33 | 1.27 |
| 4.00 | 2.61 | 1.46 | 2.79 | 1.73 | 3.11 | 2.26 |
| 5.00 | 3.26 | 2.28 | 3.49 | 2.70 | 3.89 | 3.53 |
| 6.00 | 3.92 | 3.29 | 4.19 | 3.89 | 4.66 | 5.09 |
| 7.00 | 4.57 | 4.48 | 4.89 | 5.29 | 5.44 | 6.92 |
| 8.00 | 5.22 | 5.85 | 5.58 | 6.91 | 6.22 | 9.04 |
| 9.00 | 5.88 | 7.40 | 6.28 | 8.75 | 6.99 | 11.44 |
| 10.00 | 6.53 | 9.14 | 6.98 | 10.80 | 7.77 | 14.13 |
| 11.00 | 7.18 | 11.06 | 7.68 | 13.07 | 8.55 | 17.09 |
| 12.00 | 7.83 | 13.16 | 8.38 | 15.55 | 9.33 | 20.34 |
| 13.00 | 8.49 | 15.44 | 9.07 | 18.25 | 10.10 | 23.87 |
| 14.00 | 9.14 | 17.91 | 9.77 | 21.17 | 10.88 | 27.69 |
| 15.00 | 9.79 | 20.56 | 10.47 | 24.30 | 11.66 | 31.78 |
| 16.00 | 10.45 | 23.39 | 11.17 | 27.65 | 12.43 | 36.16 |
| 17.00 | 11.10 | 26.41 | 11.87 | 31.21 | 13.21 | 40.83 |
| 18.00 | 11.75 | 29.61 | 12.56 | 34.99 | 13.99 | 45.77 |
| 19.00 | 12.40 | 32.99 | 13.26 | 38.99 | 14.77 | 51.00 |
| 20.00 | 13.06 | 36.55 | 13.96 | 43.20 | 15.54 | 56.51 |

TABLE 2—FLOW RATE, VELOCITY, AND FRICTION LOSS (WATER)
³/₄-INCH COPPER TUBING, ASTM B88 WITH 10-MIL ACE DURAFLO® COATING (Continued)

| | | | | | | |
|-------|-------|-------|-------|--------|-------|--------|
| 21.00 | 13.71 | 40.30 | 14.66 | 47.63 | 16.32 | 62.30 |
| 22.00 | 14.36 | 44.23 | 15.36 | 52.27 | 17.10 | 68.37 |
| 23.00 | 15.02 | 48.34 | 16.05 | 57.13 | 17.87 | 74.73 |
| 24.00 | 15.67 | 52.63 | 16.75 | 62.21 | 18.65 | 81.37 |
| 25.00 | 16.32 | 57.11 | 17.45 | 67.50 | 19.43 | 88.29 |
| 26.00 | 16.97 | 61.77 | 18.15 | 73.01 | 20.21 | 95.50 |
| 27.00 | 17.63 | 66.61 | 18.85 | 78.73 | 20.98 | 102.98 |
| 28.00 | 18.28 | 71.64 | 19.54 | 84.67 | 21.76 | 110.75 |
| 29.00 | 18.93 | 76.85 | 20.24 | 90.83 | 22.54 | 118.80 |
| 30.00 | 19.59 | 82.24 | 20.94 | 97.20 | 23.31 | 127.14 |
| 31.00 | 20.24 | 87.81 | 21.64 | 103.79 | 24.09 | 135.76 |
| 32.00 | 20.89 | 93.57 | 22.34 | 110.59 | 24.87 | 144.66 |
| 33.00 | 21.55 | 99.51 | 23.03 | 117.61 | 25.65 | 153.84 |

TABLE 3—FLOW RATE, VELOCITY, AND FRICTION LOSS (WATER),
¹/₂-INCH, ³/₄-INCH AND 1-INCH GALVANIZED STEEL PIPE, ASTM A53 WITH 10-MIL
 ACE DURAFLO® COATING

| Flow Rate (gpm) | ¹ / ₂ " ID= 0.602 | | ³ / ₄ " ID= 0.804 | | 1" ID= 1.029 | |
|--------------------|---|--------------------------|---|--------------------------|----------------------|--------------------------|
| | Velocity (ft/sec) | Press Loss (psi/100') | Velocity (ft/sec) | Press Loss (psi/100') | Velocity (ft/sec) | Press Loss (psi/100') |
| 1.00 | 1.13 | 0.37 | 0.63 | 0.09 | 0.39 | 0.03 |
| 2.00 | 2.25 | 1.50 | 1.26 | 0.35 | 0.77 | 0.10 |
| 3.00 | 3.38 | 3.37 | 1.90 | 0.79 | 1.16 | 0.23 |
| 4.00 | 4.51 | 6.00 | 2.53 | 1.41 | 1.54 | 0.41 |
| 5.00 | 5.64 | 9.37 | 3.16 | 2.21 | 1.93 | 0.64 |
| 6.00 | 6.76 | 13.50 | 3.79 | 3.18 | 2.31 | 0.93 |
| 7.00 | 7.89 | 18.37 | 4.42 | 4.32 | 2.70 | 1.26 |
| 8.00 | 9.02 | 23.99 | 5.06 | 5.65 | 3.09 | 1.64 |
| 9.00 | 10.14 | 30.37 | 5.69 | 7.15 | 3.47 | 2.08 |
| 10.00 | 11.27 | 37.49 | 6.32 | 8.82 | 3.86 | 2.57 |
| 11.00 | 12.40 | 45.36 | 6.95 | 10.68 | 4.24 | 3.11 |
| 12.00 | 13.53 | 53.99 | 7.58 | 12.71 | 4.63 | 3.70 |
| 13.00 | 14.65 | 63.36 | 8.22 | 14.91 | 5.02 | 4.34 |
| 14.00 | | | 8.85 | 17.29 | 5.40 | 5.04 |
| 15.00 | | | 9.48 | 19.85 | 5.79 | 5.78 |
| 16.00 | | | 10.11 | 22.59 | 6.17 | 6.58 |
| 17.00 | | | 10.74 | 25.50 | 6.56 | 7.43 |
| 18.00 | | | 11.37 | 28.59 | 6.94 | 8.33 |
| 19.00 | | | 12.01 | 31.85 | 7.33 | 9.28 |
| 20.00 | | | 12.64 | 35.29 | 7.72 | 10.28 |
| 21.00 | | | 13.27 | 38.91 | 8.10 | 11.33 |
| 22.00 | | | 13.90 | 42.71 | 8.49 | 12.44 |
| 23.00 | | | 14.53 | 46.68 | 8.87 | 13.59 |
| 24.00 | | | | | 9.26 | 14.80 |
| 25.00 | | | | | 9.64 | 16.06 |
| 26.00 | | | | | 10.03 | 17.37 |
| 27.00 | | | | | 10.42 | 18.73 |
| 28.00 | | | | | 10.80 | 20.14 |
| 29.00 | | | | | 11.19 | 21.61 |


**TABLE 4—FLOW RATE, VELOCITY, AND FRICTION LOSS (WATER),
1¹/₄-INCH, 1¹/₂-INCH AND 2-INCH GALVANIZED STEEL PIPE, ASTM A53 WITH 10-MIL
ACE DURAFLO COATING**

| Flow Rate (gpm) | 1 ¹ / ₄ " ID= 1.360 | | 1 ¹ / ₂ " ID= 1.590 | | 2" ID= 2.047 | |
|--------------------|---|--------------------------|---|--------------------------|----------------------|--------------------------|
| | Velocity (ft/sec) | Press Loss (psi/100') | Velocity (ft/sec) | Press Loss (psi/100') | Velocity (ft/sec) | Press Loss (psi/100') |
| 10.00 | 2.21 | 0.61 | 1.62 | 0.28 | 0.97 | 0.08 |
| 15.00 | 3.31 | 1.37 | 2.42 | 0.63 | 1.46 | 0.18 |
| 20.00 | 4.42 | 2.43 | 3.23 | 1.11 | 1.95 | 0.31 |
| 25.00 | 5.52 | 3.80 | 4.04 | 1.74 | 2.44 | 0.49 |
| 30.00 | 6.63 | 5.47 | 4.85 | 2.51 | 2.92 | 0.71 |
| 35.00 | 7.73 | 7.45 | 5.66 | 3.41 | 3.41 | 0.96 |
| 40.00 | 8.83 | 9.73 | 6.46 | 4.46 | 3.90 | 1.26 |
| 45.00 | 9.94 | 12.32 | 7.27 | 5.64 | 4.39 | 1.59 |
| 50.00 | 11.04 | 15.20 | 8.08 | 6.96 | 4.87 | 1.97 |
| 55.00 | 12.15 | 18.40 | 8.89 | 8.42 | 5.36 | 2.38 |
| 60.00 | 13.25 | 21.89 | 9.69 | 10.02 | 5.85 | 2.83 |
| 65.00 | 14.36 | 25.70 | 10.50 | 11.76 | 6.34 | 3.33 |
| 70.00 | 15.46 | 29.80 | 11.31 | 13.64 | 6.82 | 3.86 |
| 75.00 | 16.56 | 34.21 | 12.12 | 15.66 | 7.31 | 4.43 |
| 80.00 | | | 12.93 | 17.82 | 7.80 | 5.04 |
| 85.00 | | | 13.73 | 20.12 | 8.29 | 5.69 |
| 90.00 | | | 14.54 | 22.55 | 8.77 | 6.38 |
| 95.00 | | | 15.35 | 25.13 | 9.26 | 7.11 |
| 100.00 | | | 16.16 | 27.84 | 9.75 | 7.87 |
| 105.00 | | | 16.97 | 30.70 | 10.24 | 8.68 |
| 110.00 | | | | | 10.72 | 9.53 |
| 115.00 | | | | | 11.21 | 10.41 |
| 120.00 | | | | | 11.70 | 11.34 |
| 125.00 | | | | | 12.19 | 12.30 |
| 130.00 | | | | | 12.67 | 13.31 |
| 135.00 | | | | | 13.16 | 14.35 |
| 140.00 | | | | | 13.65 | 15.43 |
| 145.00 | | | | | 14.14 | 16.55 |
| 150.00 | | | | | 14.62 | 17.71 |
| 155.00 | | | | | 15.11 | 18.91 |

ePIPE®

Epoxy - Barrier Coating

Non-Toxic



Part **A**

For Professional Application Only.


Coating

A

Material Supplied As A Unit.
Mix All Of A Component
with All Of B Component.

KEEP FROM FREEZING

Zero VOC




Net Contents:
One U.S. Gallon
(3.785 Liters)

ACE DuraFlo Systems, LLC, 3122 West Alpine Street, Santa Ana, California, 92704 1.888.775.0220 • www.ePIPEinfo.com

ePIPE®

Epoxy - Barrier Coating

Non-Toxic



Part **B**

For Professional Application Only.


Coating

B

Material Supplied As A Unit.
Mix All Of A Component
with All Of B Component.

KEEP FROM FREEZING

Zero VOC



Net Contents:
One U.S. Gallon
(3.785 Liters)

ACE DuraFlo Systems, LLC, 3122 West Alpine Street, Santa Ana, California, 92704 1.888.775.0220 • www.ePIPEinfo.com

Figure 1 – Epoxy Canister Label



Figure 2 – Date and Batch Number Stamp on Top of Canister

ATTENTION!

EPOXY LINED PIPE

All repairs or modifications to this pipe must be carried out using flameless/heatless technology following the ePIPE® technical procedures and specifications.



AN ACE DURAFLO PRODUCT

For more information please call:

888-775-0220

www.ePIPEinfo.com

DO NOT REMOVE
DO NOT REMOVE
DO NOT REMOVE
DO NOT REMOVE





ePIPE® Epoxy Lined Piping Systems

Figure 3 – Caution Label